WHAT IS CLAIMED IS:

1. A stator of a rotary electric machine comprising:

a stator core having a plurality of slots;

a poly-phase winding disposed in the slots comprising a plurality of sub-winding sets, each sub-winding set comprising a plurality of phase windings including a plurality of straight portions disposed in the slots and a plurality of turn portions connecting between the straight portions, the phase winding being made of a continuous wire providing an individual coil on the stator core; and

connecting portions provided on an outside of the stator core connecting between the phase windings in the same phase.

2. The stator of the rotary electric machine according to claim 1, wherein each of the turn portions connects a pair of straight portions each disposed in the slots spacing apart by a predetermined magnetic pole pitch and each disposed in an adjacent position in their corresponding slot.

3. The stator of the rotary electric machine according to claim 2, wherein the turn portions are mainly formed so that the straight portions radially adjacent in the same slot are connected to the different turn portions extending in opposite directions.

4. The stator of the rotary electric machine according to claim 3, wherein the turn portion has a center portion twisted in a radial direction to provide a radial step and a pair of half portions shifted a predetermined radial distance at the center portion, and wherein the half portion of the one of the phase windings located on a radial inner layer

crosses the half portion of the other one of the phase windings located on a radial outer layer.

5. The stator of the rotary electric machine according to claim 1, wherein the phase winding is made of a continuous wire from a start end to a finish end wound around the stator core.

6. The stator of the rotary electric machine according to claim 1, wherein the wire of the phase winding has a round cross section.

7. The stator of the rotary electric machine according to claim 1, wherein the slot has a plurality of positions adjacent circumferentially in which the straight portions are accommodated.

8. The stator of the rotary electric machine according to claim 1, wherein the slot has a circumferential width narrower than that of a tooth formed between the slots.

9. A method for manufacturing a stator of a rotary electric machine comprising a stator core having a plurality of slots and a poly-phase winding, the method comprising:

manufacturing a plurality of sub-winding sets each comprising a plurality of phase windings, each phase winding comprising a plurality of straight portions and turn portions connected in series;

disposing the straight portions of the sub-winding sets in the slots of the stator core from an inner openings of the slots by shrinking the sub-winding sets, inserting the shrunken sub-winding sets into a cavity of the stator core and expanding the shrunken sub-winding sets; and

connecting the phase windings in the same phase.

10. The method for manufacturing the stator of the rotary electric machine according to claim 9, further comprising narrowing the width of the inner openings of the slots by plastically deforming ends of teeth formed between the slots.

11. A stator of a rotary electric machine comprising:

a stator core having a plurality of slots; and

a poly-phase winding comprising accommodated portions accommodated in the slots to provide at least two pairs of the accommodated portions, each of the pairs including an inner layer and an outer layer with respect to a radial depth of the slots, and turn portions connecting a pair of accommodated portions in the different layers and providing coil ends on opposite sides of the stator core, wherein the poly-phase winding comprises a plurality of phase windings, each phase winding being made of a continuous wire, and the turn portions being arranged side by side with respect to a radial direction on the one side of the stator core.

12. The stator of the rotary electric machine according to claim 11, wherein the turn portions form a surrounding arrangement on one side of the stator core by surrounding one group of turn portions with another group of turn portions.

13. The stator of the rotary electric machine according to claim 11, wherein the turn portions arranged side by side, form a concentric arrangement on one side of the stator core by arranging the turn portions concentrically.

14. The stator of the rotary electric machine according to claim 13, wherein the concentric arrangement is disposed only on the one side of the stator core, and the turn portions form a surrounding arrangement only on another side of the stator core by surrounding one group of turn portions with another group of turn portions.

15. The stator of the rotary electric machine according to claim 11, wherein an even number of the accommodated portions are layered in the slot.

16. The stator of the rotary electric machine according to claim 11, wherein the poly-phase winding is made of wire which has a round cross section.

17. A method for manufacturing a stator of a rotary electric machine comprising a stator core having a plurality of slots opening inside and a poly-phase winding, the method comprising:

preparing a poly-phase wave winding having a plurality of first turn portions on both axial ends and a plurality of middle portions between them;

forming at least two straight portions and a second turn portion between them on each of the middle portions by folding the poly-phase wave winding at a predetermined position of

the middle portions and shifting the straight portions placed on opposite sides of the predetermined position of the middle portions by a predetermined magnetic pole pitch; and mounting the poly-phase winding on the stator core by shrinking the poly-phase winding, inserting the shrunken poly-phase winding into a cavity of the stator core, and expanding the poly-phase winding to insert the straight portions into the slots.

18. The method for manufacturing the stator of the rotary electric machine according to claim 17, further comprising arranging the first turn portions side by side with respect to a radial direction on one side of the stator core.

19. The method for manufacturing the stator of the rotary electric machine according to claim 18, wherein the second turn portions are formed by shifting the straight portions before folding the poly-phase wave winding.